CLAIMS

1. A dispersion compensating birefringent filter comprising:

a pair of polarization selections elements;

a birefringent element assembly disposed intermediate the pair of polarization selections elements;

wherein the birefringent assembly is configured so as to provide a dispersion vs. wavelength curve wherein each dispersion value thereof is approximately opposite in value to a dispersion value at the same wavelength for at least one other component of an optical system, so as to mitigate dispersion in the optical system.

2. The dispersion compensating birefringent filter as recited in claim 1, wherein the birefringent assembly comprises three birefringent elements, each birefringent element having an angular orientation of a fast axis thereof with respect to a polarization direction of an input polarization selection element of the birefringent filter such that the birefringent filter provides a dispersion vs. wavelength curve wherein each dispersion value thereof is approximately opposite in value to a dispersion value at the same wavelength for at least one other component of an optical system.

3. The dispersion compensating birefringent filter as recited in claim 1, wherein the birefringent assembly comprises two birefringent elements, each birefringent element having an angular orientation of a fast axis thereof with respect to a polarization direction of an input polarization selection element of the birefringent filter such that the birefringent filter provides a dispersion vs. wavelength curve wherein each dispersion value thereof is approximately opposite in

value to a dispersion value at the same wavelength for at least one other component of an optical system.

4. The dispersion compensating birefringent filter as recited in claim 1, wherein the dispersion vs. wavelength curve is tunable.

5. The dispersion compensating birefringent filter as recited in claim 1, wherein the dispersion vs. wavelength curve is tunable by varying angular orientations of a fast axis of at least one birefringent element with respect to a polarization direction of an input polarization selector.

6. A low dispersion interleaver assembly comprising:

a first interleaver;

a second interleaver; and

wherein the first interleaver is configured so as to provide a dispersion vs. wavelength curve wherein each dispersion value thereof is approximately opposite in value to a dispersion value at the same wavelength for the second interleaver, so as to mitigate dispersion in the interleaver assembly.

7. The low dispersion interleaver assembly as recited in claim 6, wherein:

each interleaver comprises a plurality of birefringent elements; and

angular orientations of the birefringent elements of the first interleaver are related to angular orientations of the birefringent elements of the second interleaver in a manner which mitigate dispersion in the interleaver assembly.

8. The low dispersion interleaver assembly as recited in claim 6, wherein:

each interleaver comprises first, second and third birefringent elements;

angular orientations of the first, second and third birefringent elements of the first interleaver are φ_1, φ_2 and φ_3, respectively; and

angular orientations of the first, second and third birefringent elements of the second interleaver are $90° - \varphi_1$, $90° - \varphi_2$ and $90° - \varphi_3$, respectively.

9. The low dispersion interleaver assembly as recited in claim 6, wherein

each interleaver comprises first, second and third birefringent elements;

angular orientations of the first, second and third birefringent elements of the first interleaver are φ_1, φ_2 and φ_3, respectively; and

angular orientations of the first, second and third birefringent elements of the second interleaver are $90° + \varphi_1$, $90° + \varphi_2$ and $90° + \varphi_3$, respectively.

10. The low dispersion interleaver assembly as recited in claim 6, wherein:

the first interleaver and the second interleaver each comprise a plurality of birefringent elements; and

the phase delays of the birefringent elements of the first interleaver are in the same order from input to output as the phase delays of the birefringent elements of the second interleaver.

11. The low dispersion interleaver assembly as recited in claim 10, wherein:

the first interleaver comprises first, second and third birefringent elements having phase delays seletected from the group consisting of:

Γ for the first birefringent element, 2Γ, for the second birefringent element, and 2Γ for the third birefringent element; and 2Γ for the first birefringent element, 2Γ for the second birefringent element and Γ for the third birefringent element;

the second interleaver comprises first, second, and third birefringent elements having phase delays selected from the group consisting of:

Γ for the first birefringent element, 2Γ for the second birefringent element, and 2Γ for the third birefringent element; and 2Γ for the first birefringent element, 2Γ for the second birefringent element and Γ for the third birefringent element.

12. The low dispersion interleaver assembly as recited in claim 11, wherein:

the first, second, and third birefringent elements of the first interleaver have angular orientations of φ_1, φ_2, φ_3, respectively;

the first, second, and third birefringent elements of the second interleaver have angular orientations selected from the group consisting of:

$90° - \varphi_1$ for the first birefringent element, $90° - \varphi_2$ for the second birefringent element, and $90° - \varphi_3$ for the third birefringent element; and

$90° + \varphi_1$ for the first birefringent element, $90° + \varphi_2$ for the second birefringent element, and $90° + \varphi_3$ for the third birefringent element.

13. The low dispersion interleaver assembly as recited in claim 6, wherein:

the first interleaver and the second interleaver each comprise a plurality of birefringent elements; and

the phase delays of the birefringent elements of the first interleaver are in an opposite order from input to output with respect to the phase delays of the birefringent elements of the second interleaver.

14. The low dispersion interleaver assembly as recited in claim 13, wherein:

the first interleaver comprises first, second and third birefringent elements have phase delays selected from the group consisting of:

Γ for the first birefringent element, 2Γ for the second birefringent element, and 2Γ for the third birefringent element; and 2Γ for the first birefringent element, 2Γ for the second birefringent element and Γ for the third birefringent element;

the second interleaver comprised first, second, and third birefringent elements have phase delays selected from the group consisting of:

2Γ for the first birefringent element, 2Γ for the second birefringent element, and Γ for the third birefringent element; and Γ for

the first birefringent element, 2Γ for the second birefringent element and

2Γ for the third birefringent element.

15. The low dispersion interleaver assembly as recited in claim 14, wherein:

the first, second, and third birefringent elements of the first interleaver have angular orientations of φ_1, φ_2, φ_3, respectively;

the first, second, and third birefringent elements of the second interleaver, for a component output from the first interleaver which is parallel to an input thereto, have angular orientations selected from the group consisting of:

$90° - \varphi_3$ for the first birefringent element, $90° - \varphi_2$ for the second birefringent element, and $90° - \varphi_1$ for the third birefringent element; and

$90° + \varphi_3$ for the first birefringent element, $90° + \varphi_2$ for the second birefringent element, and $90° + \varphi_1$ for the third birefringent element;

the first, second, and third birefringent elements of the second interleaver, for a component output from the first interleaver which is orthogonal to an input thereto, have angular orientations selected from the group consisting of:

φ_3 for the first birefringent element, φ_2 for the second birefringent element and φ_1 for third birefringent element; and

$-\varphi_3$ for the first birefringent element, $-\varphi_2$ for the second birefringent element, and $-\varphi_1$ for third birefringent element.

16. The low dispersion interleaver assembly as recited in claim 6, wherein:

each interleaver comprises first and second birefringent elements;

angular orientations of the first and second birefringent elements of the first interleaver and angular orientations of the first and second birefringent elements of the second interleaver are selected from one of the groups consisting of:

φ_1 and φ_2 for the angular orientations of the first and second birefringent elements, respectively, of the first interleaver and either ($90° + \varphi_1$ and $90° + \varphi_2$), ($90° - \varphi_1$ and $90° - \varphi_2$), ($90° + \varphi_3$ and $90° + \varphi_2$), ($90° - \varphi_3$ and $90° - \varphi_2$), (φ_3 and φ_2) or ($-\varphi_3$ and $-\varphi_2$) for the first and second birefringent elements, respectively, of the second interleaver; and

φ_3 and φ_2 for the angular orientations of the first and second birefringent elements, respectively, of the first interleaver and either ($90° + \varphi_3$ and $90° + \varphi_2$), ($90° - \varphi_3$ and $90° - \varphi_2$), ($90° + \varphi_1$ and $90° + \varphi_2$), ($90° -\varphi_1$ and $90° -\varphi_2$), (φ_1 and φ_2) or ($-\varphi_1$ and $-\varphi_2$) for the first and second birefringent elements, respectively, of the second interleaver.

17. The low dispersion interleaver assembly as recited in claim 6, wherein:

the first interleaver comprises a N GHz interleaver; and

the second interleaver comprises a N/2 GHz interleaver.

18. A method for forming a low dispersion interleaver assembly, the method comprising forming two interleavers, each interleaver defining a stage, configured such that light passes sequentially therethrough, each interleaver being formed by selecting first stage phase delays, first stage orientations, second stage phase delays and second stage orientations from the table:

First Stage	First Stage	Second Stage	Second Stage

Phase Delays	Orientations	Phase Delays	Orientations
Γ, 2Γ, 2Γ	$\varphi_1, \varphi_2, \varphi_3$	Γ, 2Γ, 2Γ	$90°\pm\varphi_1, 90°\pm\varphi_2, 90°\pm\varphi_3$ (parallel component) $90°\pm\varphi_1, 90°\pm\varphi_2, 90°\pm\varphi_3$ (orthogonal component)
2Γ, 2Γ, Γ	$\varphi_3, \varphi_2, \varphi_1$	2Γ, 2Γ, Γ	$90°\pm\varphi_3, 90°\pm\varphi_2, 90°\pm\varphi_1$ (parallel component) $90°\pm\varphi_3, 90°\pm\varphi_2, 90°\pm\varphi_1$ (orthogonal component)
Γ, 2Γ, 2Γ	$\varphi_1, \varphi_2, \varphi_3$	2Γ, 2Γ, Γ	$90°\pm\varphi_3, 90°\pm\varphi_2, 90°\pm\varphi_1$ (parallel component) $\pm\varphi_3, \pm\varphi_2, \pm\varphi_1$ (orthogonal component)
2Γ, 2Γ, Γ	$\varphi_3, \varphi_2, \varphi_1$	Γ, 2Γ, 2Γ	$90°\pm\varphi_1, 90°\pm\varphi_2, 90°\pm\varphi_3$ (parallel component) $\pm\varphi_1, \pm\varphi_2, \pm\varphi_3$ (orthogonal component)